

**EXPRESS MAIL LABEL NO. EL470370794US**  
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**PATENT**

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**SYSTEM AND METHOD FOR GROUPING RECIPIENTS OF STREAMING DATA**

**Background Of The Invention**

**1. Field of the Invention**

This invention relates in general to the transmission of data in a data stream over a telecommunications medium such as the Internet and, more particularly to the placement of recipients of that streaming data into identifiable groups by space or time, relative to the streaming data, to avoid congestion of users making demands for the streaming data substantially at the same time or at the same place in the data transmission.

**2. Description of the Prior Art**

Streaming data transmitted through the Internet, is a well-known technique for sending data expected to be received in a continuous form. Such data, for example, may be the current prices at the New York Stock Exchange, or video data such as a replay of a sport highlight or a fashion show. While the resources which may be

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allocated for transmitting the data may be adequate in many cases, at other times, the resources for sending the data may be inadequate for the task relative to the number of recipients demanding the data at substantially the same time or at the same place in the data base or data store. The consequence of any such inadequate resource allocation will be congestion and disappointed recipients who demand the data but are placed low or out of the queue because there are an insufficient number of servers, for example, to retrieve the data from the store and place it on the Internet for transmission to the recipients.

Other entities which receive demands, as described above, placing an overload on the resources used to transmit the streaming data might supply music or even static web pages. Any such demand, coming from the recipient end of the transmission medium, cannot be predicted until the demands for data are made. At the same time, the recipient expects the demand to be instantly satisfied by immediate connection to the data and to promptly begin enjoying the show or the web pages or the music or whatever may be represented or contained in the data stream.

Accordingly, there is a need for managing demands or requests made at substantially the same time or at the same location in the data stream, which may be beyond the system capability for supplying the information within the time expected and which reduces this peak load and shifts it over the space of the data transmission while preserving the impression of immediate satisfaction for each information recipient.

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### Summary Of The Invention

As disclosed in a preferred embodiment, according to the inventive principles disclosed a system and method is shown for spreading the load placed on a transmission facility to drive a condition of load peaks toward a steady state condition. The system and method shown, may be described as virtually personalizing streamed data to a respective recipient or user, preserving the impression to the individual recipient that it is being immediately served with a requested data file or video or audio data feed, while at the same time, that individual recipient is being shifted in time or space, relative to the data transmission and data file or data feed, as requested. The system includes a server having a data store, with an interface for connection to a telecommunications medium and a data processor for receiving recipient's or users' requests for information to be sent in a data stream by said server over said telecommunications medium. The server, responsive to the requests, arranging the recipients or users in groups with each of the users being arranged in a respective group; and with the data processor sending the data stream from the data store, to the groups. The server can realign a respective user with a said data stream to change the location in said data stream from which the user is receiving the data, for example, by moving a pointer associated with the user's respective socket to another location in said data store, or the position of the user relative to the data in the data stream can be changed in relation to the time of the data being transmitted in said data stream, by realigning the user or recipient with a different server socket and port delivering or transmitting a time shifted part of the data transmission. As used in connection with the description of a preferred embodiment and according to the disclosed inventive principles or as claimed, a server may be any suitable device capable of performing the described or claimed functions or method steps, as may be known to one skilled in the art now or in the future and is not limited to any particular arrangement of elements for performing such server functions or steps. As would be known to one skilled in the art,

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by server is meant any device and its equivalents arranged to performed such functions or method steps, described or claimed in relation to a server whether described in its elemental parts or as a single unit or generally as a means performing a function.

5 As stated above, according to the inventive principles as disclosed in connection with the preferred embodiment, an allocation of server resources is used to reduce peak loads and drive a system for providing data in a stream for example, on demand, by grouping the users demanding the data. Such groups may be identified by time of demand or place of demand or by any other scheme for identifying the users without  
10 departing from the principles of the disclosed invention. According to the inventive principles as disclosed in connection with the preferred embodiment, the groups are assembled by a number limited with respect to the available servers available to transmit the requested data as disclosed with regard to the example shown for an Internet connection. Another such system for grouping users may be by the time of request, for example by grouping users requesting the data within a set period.  
15 According to the inventive principles as disclosed in connection with the preferred embodiment, these systems may be combined, for example, by grouping the next 10 users or the next users making a request in the next 10 seconds, whichever comes first.

20 Once the groups are assembled, a server may associate all of the users in a respective group with a server and a socket aligned with a pointer to a data location in the data store accessed or read to produce the data transmission. As successive groups are assembled, according the system chosen, the users or recipients in the successively assembled groups may be started at the current instant in time or in the  
25 current data location being transmitted from the data store, to all of the previous groups. In that case, each user or recipient may be added at the data transmission is in progress. A data loop may be employed to transmit the data continuously so each user or recipient may receive the whole content, as the data transmission progresses

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through its loop and starts again. In this way, users or recipients may be entering or receiving the data transmission or leaving and terminating the data transmission, as the data transmission returns to the time or data location of an individual's connection to the data, individually, without disturbing any other recipient. If the system is arranged to terminate a group and its users when a loop transmission is at its logical end, according to the inventive principles as disclosed in connection with the preferred embodiment, the user may request a reconnect to another group in formation or be automatically place in another such group, to receive the portion missed, for example from the beginning.

Where the system uses data in the form of signaling between the recipient or user and the server to acknowledge successful receipt of the data or to signal data loss, the system may be arranged, according to the inventive principles as disclosed in connection with the preferred embodiment, to continue the transmission without providing the lost data, or alternatively, the user or recipient can be moved to another group receiving the data transmission from a time in the data transmission corresponding to the lost data portion.

According to the inventive principles as disclosed in connection with the preferred embodiment, the user or recipient may be moved relative to the time or data store location of the data transmission, by moving the recipient or user to successive groups or server connections associated with different parts of the data. In this way, the user may be alternatively connected, for example and according to the inventive principles as disclosed in connection with the preferred embodiment, with selected material such as advertisements interspersed in the data transmission.

The systems or data protocols for signaling the successful receipt of data or loss of data as well as the systems and methods for assembling users requesting data and assembling such users in a group by time of request or in a group by the group size, is

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well known to those of ordinary skill in the art and not described. As used in describing the invention according to the inventive principles as disclosed in connection with the preferred embodiment, the transmission of data as described in a data stream or as streaming data is not to be limited to a continuous data stream but may include discontinuous data or data which is sent in frames or in any other relationship, or a data file transmitted repetitively.

**Brief Description Of The Drawings**

Fig. 1 is a block diagram showing an exemplary system for serving streaming data individually on a one to one relationship through individual server ports and sockets matched to each such user or recipient.

Fig. 2 is a block diagram illustrating users or recipients that are grouped so each user or recipient in a respective group receives the same data from the same port, according to a preferred embodiment of the present invention.

Fig. 3 is a flow diagram for an exemplary system for resetting a user to a different location in the data, according to a preferred embodiment of the present invention.

Fig. 4 is a block diagram, according to the inventive principles as disclosed in connection with the preferred embodiment, illustrating a system for shifting users between ports receiving or accessing respective locations in the data store, for example, to shift the user within the data transmission or to shift the user to material inserted into a data stream.

Fig. 5 shows in a block diagram an example of a networked server as may be

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used in connection with the disclosed invention.

### **Description Of A Preferred Embodiment**

5 A system for transmitting data in a data stream or streaming data, directly to individual users, is shown in Fig. 1. As shown, each user U1, U2, ... Un, is associated with a respective port and socket in a server. As would be well known to one of ordinary skill in the art, a socket may be an arrangement of data and command standards for designating addresses, data structure and data signaling standards.

10 According to the inventive principles as disclosed in connection with the preferred embodiment, in one example, shown in Fig. 2, where data is sent in blocks or in packets, as known to those of ordinary skill in the art, lost data may be identified by identifiable blocks or packets of data, and the user, when assembled in a group according to the principles of the invention, may be realigned with the data transmission to recover the lost data. As shown in Fig. 2, the users are associated in groups and assembled by number or time of request, as described above. For example, users U1, U2, and U3, are assembled into a group to receive the data transmission from server port P0 currently associated with time T0 in the data stream, through user respective sockets connected to that port. Similarly, U4, U5, and U6 are assembled as described above, into another respective group to receive the data transmission shifted with respect to the data transmission from port P1, associated with time T1 in the data stream, through the users' respective sockets. This arrangement may be repeated to users Un-2, Un-1 and Un, for example. In the example shown in Fig. 2, users U1 to U3 are at point T0 in the data transmission and users U4 to U6 are at point T1, and so on. As stated above, the users U1 to Un, may be assembled in groups by grouping a discrete number of requesting users or by grouping users, requesting the data

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transmission within a designated time.

In the example shown in Fig 3, the system for shifting groups of users is described in a block diagram. In a typical application, a user may request a data transmission at some point in the data flow, whether at the beginning or after. The user may make its request because of an announcement of an event to start at a specified time or randomly, depending on when the user first hears of the event and desires to access the data. For example, an announcement of the rebroadcast of the President's State of the Nation speech at a designated time may cause more individual users to access the available servers than there are servers available to immediately provide the data. In that case, the system, to provide to the user a virtual personalized data transmission, arranges the users in respective groups, defined for example, by respective server port or with a respective socket aligned with a pointer  $P_i$  at a respective location in the data store and media stream  $M$ . At that time, the server may begin to transmit the data from the store  $M$  to the users associated with the respective socket and pointer  $P_i$ . Where a data signaling system is used to indicate the successful transmission of data, the pointer is advance to the next location in the media stream  $M$  for transmission. Where there is an indication of lost data, the server may reconnect the user suffering lost data with another server port and socket aligned with a pointer  $P_j$  closest to, and before, the identified lost blocks or packets or otherwise identified data. The server then would continue to be used to transmit the data as before, with the only change being the user's location in the stream media  $M$  connected to the user.

Fig. 4 shows the system and method according to the inventive principles as disclosed in connection with the preferred embodiment, with a user associated with a single socket at various time intervals  $T_1, T_2, T_3, \dots, T_i, T_{i+1}, T_{i+2}$ . In the disclosed example, the socket for a user is connected with a pointer to the media  $M$ . Where new material is to be inserted into the data transmission, for example at time  $T_i$ , and time



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5 Ti+1, the socket is moved from pointer  $P_i$  to a pointer accessing the inserted material, which would be from another location in the data store or from another data store. At time  $T_{i+2}$ , at the end of the inserted material, the socket is again reconnected with pointer  $P_i$  and the data transmission resumed. Alternatively, a user associated with a pointer,  $P_1$  for example, may be time shifted to another location in the data stream, for example time  $T_{i+2}$ , by associating that user with another socket associated with respective pointer  $P_{i+1}$ . There is no restriction on the time spent in streaming inserted material or on the number of inserts or on the time interval shifted for any user in a group as it is accomplished by shifting that user to another group associated with a different pointer into the data media  $M$  or to a socket receiving the data at a different time location in the data stream.

10 According to the inventive principles as disclosed in connection with the preferred embodiment, the invention may be practiced using one or more general purpose computers responsive to one or more software programs prepared or written to perform the functions or the steps, described, as would be known to one of ordinary skill in the art.

15 The invention shown according to the inventive principles as disclosed in connection with the preferred embodiment is not limited to the examples shown. The data storage, access, serving and transmission systems and data signaling and protocol systems for arranging data into identifiable parts for recognition, interpretation and routing, may be any suitable systems presently available or as may be developed and as would be known to those of ordinary skill in the art.

20 The present invention, as would be known to one of ordinary skill in the art could be produced in hardware or software, or in a combination of hardware and software. The system, or method, according to the inventive principles as disclosed in connection

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with the preferred embodiment, may be produced in a single computer system having separate elements or means for performing the individual functions or steps described or claimed or one or more elements or means combining the performance of any of the functions or steps disclosed or claimed, or may be arranged in a distributed computer system, interconnected by any suitable means as would be known by one of ordinary skill in art. According to the inventive principles as disclosed in connection with the preferred embodiment, the invention and the inventive principles are not limited to any particular kind of computer system but may be used with any general purpose computer, as would be known to one of ordinary skill in the art, arranged to perform the functions described and the method steps described. The operations of such a computer, as described above, may be according to a computer program contained on a medium for use in the operation or control of the computer, as would be known to one of ordinary skill in the art. The computer medium which may be used to hold or contain the computer program product, may be a fixture of the computer such as an embedded memory or may be on a transportable medium such as a disk, as would be known to one of ordinary skill in the art. The invention is not limited to any particular computer program or logic or language, or instruction but may be practiced with any such suitable program, logic or language, or instructions as would be known to one of ordinary skill in the art. Without limiting the principles of the disclosed invention any such computing system can include, inter alia, at least a computer readable medium allowing a computer to read data, instructions, messages or message packets, and other computer readable information from the computer readable medium. The computer readable medium may include non-volatile memory, such as ROM, Flash memory, floppy disk, Disk drive memory, CD-ROM, and other permanent storage. Additionally, a computer readable medium may include, for example, volatile storage such as RAM, buffers, cache memory, and network circuits. Furthermore, the computer readable medium may include computer readable information in a transitory state medium such as a network link and/or a network interface, including a wired network or a wireless network, that

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allow a computer to read such computer readable information.

By way of example and without limiting the principles of the invention as disclosed, an example of a networked system for receiving users' requests for data, for  
5 arranging the users in groups with respect to the time or location in the data, and for sending the data in separate respective data streams to the respective groups, is shown generally by numeral 100 in Fig. 5. The system includes a server 110 having a data processor 120 and memory 125, with data store 130 and interface 140 for connection to  
10 a network such as for example, the World Wide Web or Internet, using a suitable software program such as a web browser. Data flow within the server 110 is as shown by bi-directional arrows 150, 160 170. A suitable computer program 135, as would be known to one of ordinary skill in the art, could be stored within data store 130 for transfer to processor memory 125 and use by processor 120 for performing the  
15 disclosed functions and method steps. As would be understood by those of ordinary skill in the art, the computer program may be contained or recorded in any suitable active or dynamic, stable or interim memory, as currently available or as may be developed by processor 120. As shown in Fig. 5, interactive connections are made with users  $n_1, n_2, n_3, \dots, n_{m-2}, n_{m-1}, n_m$ . Information in the form of requests and data in the form of streaming data is shown by the respective bi-directional arrows 210, 220, 230,  
20 240, 250, 260. As would be known to one of ordinary skill in the art, the system of Fig. 5 is shown by way of example without limiting the disclosed invention.

Although specific embodiments of the invention have been disclosed, it will be understood by those having ordinary skill in the art, that changes can be made to the  
25 specific embodiments without departing from the spirit and scope of the invention. The scope of the invention is not to be restricted, therefore, to the specific embodiments, and it is intended that the appended claims cover any and all such applications,

Figure 1: A schematic diagram of a two-dimensional lattice. It shows a central square unit cell with four atoms at the corners. The lattice is composed of these unit cells arranged in a grid. Labels include 'a' for the lattice constant, 'b' for the bond length, and 'c' for the distance between atoms. The diagram is labeled 'Figure 1' and 'Figure 2'.

What is claimed is:

$\frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{-x^2} dx = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{\infty} f(x) e^{-x^2} dx$